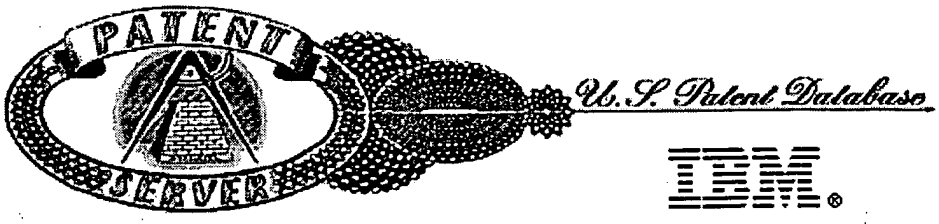

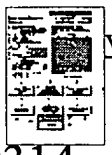

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5189314 : Variable chip-clocking mechanism

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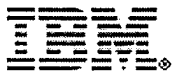

Contact the IBM Licensing Department for information about this patent

ISSUED: **Feb. 23, 1993** FILED: **Sep. 4 , 1991**
SERIAL NUMBER: **754795** MAINT. STATUS:
INTL. CLASS (Ed. 5):**H03K 003/72;**
U.S. CLASS: **307/271**; 307/231; 307/310; 377/049;
FIELD OF SEARCH: **307-271,231,310** ; **377-049** ;

ABSTRACT: The performance of some chips (e.g., VLSI processors) may be increased by running the internal circuits at higher clock rates, but use of a higher clock rate is limited by the heat-dissipation ability of the chip's package. Apparatus and a method is described for estimating the total heat accumulated for dissipation at any given time. For the periods that the chip is idle, the clock rate is decreased to reduce heat generation. The heat saved while the chip is idling is available for use later to increase the clock rate above normal, provided that the total heat generated does not exceed the heat-dissipation capacity of the package.

U.S. REFERENCES: Show the 6 patents that reference this one

Patent	Inventor	Issued	Title
4489279	Kuroki	12 /1984	Variable-frequency oscillator having a crystal oscillator
4670837	Sheets	6 /1987	Electrical system having variable-frequency clock
5008771	Palara	4 /1991	Diagnostic circuit for units providing current control and protection against excessive heat dissipation for semiconductor power devices
5073838	Ames	12 /1991	Method and apparatus for preventing damage to a temperature-sensitive semiconductor device

EXEMPLARY CLAIM(s): Show all 7 claims

We claim:

1. A variable clocking mechanism for an electronic circuit chip in which heat generated by circuits in the chip and speed performance of those circuits both increase with a clock frequency used to clock those circuits, comprising:

- means for generating a high clock frequency for clocking circuits in said chip at a higher than normal rate, said circuits generating heat when clocked at said high clock frequency at a rate which cannot be sustained indefinitely without damage to said chip;
- means for generating a low clock frequency for clocking circuits in said chip at a lower than normal rate, said circuits generating less heat when clocked at said low clock frequency than if

said circuits were clocked at a normal rate;

- activity monitoring means for sensing an idle status for circuits in said chip;
- means responsive to said activity monitoring means for clocking circuits in said chip at said low clock frequency when said circuits are idle;
- a heat savings accumulator responsive to said clock frequency used to clock said circuits in said chip for estimating an amount of heat generation which is avoided as a result of clocking circuits in said chip at said low clock frequency minus an amount of heat generation which is added as a result of clocking circuits in said chip at said high clock frequency, said heat accumulator having a maximum heat savings which can be accumulated; and
- means responsive to said heat savings accumulator and said activity monitor for clocking at least some of the circuits in said chip which are not idle at said high clock frequency if heat savings have been accumulated.

RELATED U.S. APPLICATIONS: **none**
FOREIGN APPLICATION PRIORITY DATA: **none**
FOREIGN REFERENCES: **none**
OTHER REFERENCES: **none**
ATTORNEY, AGENT, or FIRM: **Drumheller; Ronald L.;**
PRIMARY/ASSISTANT EXAMINERS: **Sikes; William L.**; Ouellette; Scott A.

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